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UNIDO POLICIES: UNIDO ENERGY PROGRAMME

Proposed by the Director-General

Summary

Examines the basic considerations for UNIDO energy-related activities, including the interrelation between energy and economic development and proposes specific directions for the Organization's prospective energy activities. In accordance with Board decision IDB.7/Dec.14, paragraph (k), presents to the Board for approval the proposed energy programme for the biennium 1992-1993.

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Introduction

1. Energy, together with environment, is identified as one of the five priorities set for the 1990's in the medium-term plan, 1990-1995 (GC.3/17, para. 23). At its sixth session, in decision IDB.6/Dec.7, the Industrial Development Board approved the proposed UNIDO environment programme and its activities as outlined in paragraphs 3 to 28 of document IDB.6/3 and took note that the programme would be funded through special-purpose contributions to the Industrial Development Fund and other sources of funds without adversely affecting net aid flow to the developing countries. Subsequently, in its decision IDB.7/Dec.14, paragraph (k), the Board at its seventh session, requested the Director-General to identify as appropriate, extrabudgetary resources for the implementation of the environment programme and to present to the policy-making organs for approval the energy programme proposed for the 1992-1993 biennium and described in paragraphs 67 to 76 of the draft medium-term plan, 1992-1997 submitted by the Director-General in document IDB.7/7 (corresponding to paras. 69 to 81 of the revised draft medium-term plan contained in document PBC.7/17).

2. In proposing an energy programme for UNIDO, the present document outlines the considerations central to the formulation of such a programme. The document also takes into account UNIDO's experience in the field of energy - an experience based on requests received from developing countries and thus reflecting their particular needs for assistance in energy supply and energy conservation.

I. FRAMING AN ENERGY POLICY FOR UNIDO: BASIC CONSIDERATIONS

Critical need for energy

3. Energy is indispensable for economic growth in particular in the context of industrial development. The relationship between energy supply, energy use, and economic growth does need to be discussed in the context of the proposed UNIDO energy programme because of the special problems facing the developing countries with respect both to the use and the production of energy.

4. Demand for energy will grow most rapidly in the developing countries, all the more so if their economic growth targets can be realized. They require increasing amounts of energy in order to continue to grow economically, and conservation, while important, cannot offset the need for new and increased energy supplies.

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The burden of energy costs

5. All costs related to energy loom large - the costs of supply, the costs of conservation and especially the lost opportunity costs due to inadequate energy supplies. Energy supply frequently takes up a large fraction of the import costs of developing countries - up to 40 per cent in some cases - and energy investments usually are the largest single component in total capital outlays in both the developing and industrialized countries.

6. Since capital is especially scarce in the developing countries, the UNIDO energy programme must be mindful of the comparative costs of all the options, including energy conservation or new energy supply. Besides the burden of energy costs, there are other special aspects of energy supply which govern the design of a UNIDO energy programme, as discussed below.

Conservation potential

7. Conservation is only a limited option for the developing countries. The experience of the industrialized countries with regard to the linkage between energy and growth is not directly transferable to the developing countries. The industrialized countries were able to break that linkage for almost ten years by "exporting" heavy industry, switching to smaller cars, or by taking other measures suited to their own economies. That model, however, is inapplicable to the developing countries; for them energy conservation cannot be an alternative to new energy supplies. It must be pursued, but only in conjunction with the sustained development of new supplies of energy, which, wherever feasible, should emphasize the promotion of locally available resources. In particular, conservation costs all too frequently compete with energy supply costs (see para. 57 below). Applicable conservation efforts typically might involve major capital outlays for regeneration or heat recovery systems or even replacing old, inefficient equipment such as boilers.

8. Both conservation and production of energy tend to be capital-intensive, so the developing countries require special assistance in both areas in order to realize an efficient mix of options.

Foreign exchange costs and local energy resources

9. Foreign exchange, as well as capital, is scarce among the developing countries, and most energy options, whether the importation of fuels or of fuel-related equipment, entail important foreign exchange outlays. Thus the developing countries require assistance in identifying and developing energy options which rely as much as possible upon locally available resources, such as agricultural wastes, thermal solar energy, wind power, or other renewable sources, as well as other local resources, such as low-grade coals, for which adaptive technological options may be critically needed.

10. While the use of domestic petroleum reserves as well as imported oil will continue, such options, where economically feasible and if properly promulgated, can substitute for imported fuels and also permit greater use of domestic manufacture in place of imported equipment. Promising examples are solar collectors for hot water or wind power for pumping water, where local conditions are favourable.

Appropriate technologies

11. Another major obstacle for the developing countries in the production of energy is the lack of appropriate technologies. This is an area where UNIDO has particular expertise and which is of particular importance to the developing countries because traditional equipment manufacturers and suppliers from the industrialized countries do not necessarily produce the types of equipment best suited for the developing countries.

12. The "appropriateness" gap is particularly clear with respect to renewable energy sources, where research and development in the industrialized countries has been directed towards the more complex, more sophisticated, and larger systems, which are not readily manufactured or operated in the developing countries. An important aspect which must be recognized in the design of appropriate energy technologies for the developing countries is the different relationship between capital and labour costs. Cheaper labour means that the developing countries can potentially exploit options which might be dismissed as uneconomic in the industrialized countries, and this reinforces the need for assistance in identifying and adapting more appropriate technologies.

13. There is scope for major contributions to be made to the supply of locally available energy, provided that such technologies can be promoted and propagated.

Energy pricing and taxation

14. Pricing and taxation policies are a further impediment to the efficient use of energy in many countries, but especially in the developing countries. If energy prices are set below world market levels, then neither firms nor individuals would perceive financial incentives to conserve energy, even when conservation otherwise would be economically desirable. For example, when designing plants in the developing countries, foreign firms frequently misspecify insulation requirements or underestimate the size of recuperators because energy is not worth saving when priced at the low levels stipulated in the design documents. Such distortions are especially serious, since they add to the difficulties of developing conservation programmes which can be self-sustaining. Thus, if prices are artificially low, conservation projects are less likely to succeed.

15. It will be important for UNIDO to assist the developing countries in evolving more effective incentive structures to develop demonstration projects in energy conservation that can serve as examples for sustained conservation.

Environmental trade-offs

16. Environmental concerns are especially vexing for the developing countries because virtually all energy options with lower environmental impacts are also substantially more costly. The direct trade-off between cost and environmental protection seriously limits the available options. Furthermore, each country is constrained in terms of the economic resources that it can afford to devote to environmental protection.

17. Thus cleaner energy means less energy, where investment resources are finite. If capital is diverted to cleaner energy production or cleaner

energy use, then it follows that less energy can be produced, often by a substantial amount, or less capital is available for investment in other areas of industrial development. It must be noted that conservation itself is a form of environmental protection: if less energy is used through efficiency gains, then less pollution is released. None the less, the differences are indeed large. Clean, low-sulphur coal, for example, can cost almost twice as much as the lower-quality varieties, or, alternatively, a coal-fired power plant, fully equipped with sulphur dioxide scrubbers and filter systems, typically costs 50-85 per cent more than the plant with higher emissions.

18. Given the limited financial resources of the developing countries, it is important that the environmental aspects of energy projects be weighed carefully, and the major pollution issues be considered in assessment studies for new industries. UNIDO proposes to focus on ways to optimize that balance.

Basic considerations for a UNIDO programme

19. UNIDO has identified three basic considerations with respect to energy resources which should be taken into account in formulation of its energy programme:

- Is there a relative scarcity of energy resources and potential supplies?
- What are the prospects for higher energy costs in the medium-term?
- How rapid might be the growth in the combined future demand for energy of the industrialized and developing countries?

20. These are the three most important aspects of energy markets which affected the design of an energy programme for UNIDO. The choice of options for the developing countries depends upon the resolution of those questions.

21. If resources were scarce, or if the total demand for energy were to press upon available capacity, the potential energy options for the developing countries would be wider, because then it would be economically practicable to look towards some of the more costly alternatives.

22. Conversely, if energy prices are likely to remain low, the options for the developing countries - indeed for all energy users - are much more modest, and many of the renewable alternatives are much less attractive or would involve significant subsidies. The choice of options must be sensitive to energy price forecasts.

(a) Scarcity

23. Scarcity of energy is not a substantial issue. There is no global shortage of energy resources over any planning horizon used by Governments. Hence, energy policies or programmes need not be predicated upon any presumption of overall scarcity over a 25 to 50-year period. While it is true that energy resources will ultimately be depleted, that Malthusian spectre is remote, and there exist known economically exploitable energy resources from conventional sources which will suffice well into the 21st century.

24. Low-cost energy resources are known and abundant in at least three areas:

(i) Conventional oil reserves of the Middle East amount to more than 100 years' worth of current requirements. Even so, this figure may be a low estimate, as there has been little incentive to explore further for oil in the Middle East since current reserves are so large;

(ii) Coal in Australia, China, India, the Union of Soviet Socialist Republics, the United States of America, and many developing countries with deposits aggregate to well over two trillion tons and also represent at least 500 years' worth of demand;

(iii) Gas deposits in the USSR are also very large, and can be developed to serve both European and domestic markets. While transport costs are relatively high, Soviet gas, none the less, is expected to be competitive with Middle East oil for many decades.

25. According to some estimates, production from all three of these vast resource bases can be increased as needed to meet any foreseeable demand at costs of less than $20 per barrel of oil-equivalent energy.

26. This potential supply of low-cost oil, coal or gas from known areas is demand-limited; it is not constrained by resource considerations. Although there is little spare installed production capacity anywhere at the present time, there is no economic or technical constraint on the steady expansion of that production capacity to meet prospective demand.

27. Energy resources are abundant at today's prices. Moreover, if prices were to rise the energy resources would increase commensurately, so that scarcity as such is not a constraint upon an energy programme.

(b) Energy pricing

28. The price of energy is a key question, especially for the developing countries, and thus the main consideration for planning is a forecast of oil prices. The projection of oil prices is critical because oil prices have determined the overall level of energy prices for the past decades, and there is every reason to believe that they will continue to do so for the foreseeable future.

(c) Demand pressures

29. Rapid economic growth in the developing countries, together with historical growth rates in the Organisation for Economic Co-operation and Development countries, implies an overall annual increase of 2 to 3.5 per cent in energy consumption, which is less than the rates observed earlier and which can be reasonably accommodated.

30. In light of the above factors, it is unlikely that the demand for oil or energy could outstrip supply over the UNIDO planning period. It is true that the developing countries may grow more rapidly than the industrialized countries, but their current consumption is so small by comparison that even rapid growth is not likely to alter the overall balance.

31. Robust economies world wide will thus require a growing energy supply. Some of the increased requirement will be met by some growth of nuclear electricity generation and coal production world wide, but otherwise, it is to be expected - at low oil prices - that oil and gas production will be required to meet these needs.

(d) Conclusion

32. Global energy balances, together with the realities of pricing and production policies of the Organization of Petroleum Exporting Countries, imply that the needed energy can be supplied at essentially constant prices.

33. Even though energy prices may not increase, there is an important need among the developing countries for expedited assistance in adapting technologies to permit application of their domestic energy resources, while respecting environmental issues.

34. Thus there is a special need for UNIDO to aid the developing countries in identifying and exploiting their own, domestic energy resources.

35. Some developing countries do have untapped potential to exploit their own new and renewable sources of energy, like biomass, thermal, and solar energy. Other developing countries, while having under-exploited deposits of low-grade coals, are meeting their energy needs with small hydro-powered or wind-generated plants. Extensive technical assistance will be required in those countries to broaden their energy base.

36. Energy resources are indeed abundant, but none the less there remain important areas where local energy sources can be exploited efficiently and economically in developing countries. UNIDO will concentrate in those areas.

II. CURRENT ENERGY-RELATED ACTIVITIES OF UNIDO

37. The share of UNIDO's annual delivery of technical assistance to developing countries in its field of energy has increased steadily throughout the 1980's, doubling from $5.0 million in 1980 to $10.0 million in 1987, or about 10 per cent of the Organization's total delivery. UNIDO energy activities have spanned different sectors, including the production, upgrading and conservation of energy. Examples of energy-related projects undertaken in recent years and some of the areas of activity are outlined below.

38. The Department for Industrial Promotion, Consultations and Technology and the Department of Industrial Operations have jointly run a long-term programme on small hydropower in Asia and the Pacific region. Through that project a network was established seven or eight years ago with over 20 countries. The network's activities cover information exchange, cooperative research and development, training and the provision of consultancy services. The network's centre is in Hanghzou, China, and is staffed and funded by the Chinese Government. Other sources of funds for the network's activities include the Regional Energy Development Programme of the United Nations Development Programme (UNDP).

39. In addition, UNIDO has a number of programmes for the establishment of pilot plants for small hydropower in selected African countries, funded by the Austrian and Swiss Governments and UNDP, and aimed at providing a base for activities such as training programmes and local production facilities.

40. In rural areas much of the population's energy requirements are derived from biomass. UNIDO has emphasized efficient charcoal production from agricultural and wood wastes as a highlight of its biomass energy programme which is designed to reflect both the need to alleviate acute fuel shortages and to help reduce the rate of loss of tropical forests. In October 1990, a workshop was organized on biomass thermal processing in association with the Institute of Energy and Shell Research Ltd., and Cadogan Consultants in cooperation with Reading University and British Gas. It was financed by the Government of the United Kingdom through the Overseas Development Administration and by Shell Research Ltd. The project was executed within the framework of the environment programme of UNIDO, requiring the promotion of technologies which generate less waste and make reduced demands on the environment for raw materials and energy. Technical assistance in the area of energy from biomass has previously been in the form of single source aid funding. This has resulted in projects with insufficient industry interest to promote further industry-sponsored projects where processes and equipment are replicated. The objective of the workshop was to provide a sound basis for the provision of much-needed coordination and initiatives to ensure an impact for biomass projects. Working together, delegates from Africa, Asia and Latin America as well as experts in biomass energy applied their practical knowledge to develop projects in which the outputs contribute to investment in and wider-scale deployment of biomass energy processes. Twelve proposals addressing combustion, carbonization, densification and gasification were prepared by five informal groups.

41. UNIDO has carried out a large number of technical cooperation projects on solar energy, mainly related to solar thermal applications. A major project has also been carried out on the establishment of solar energy testing facilities and the local manufacture of solar energy collectors in Jordan. As part of its promotional programme, UNIDO has established the Consultative Group for Solar Energy Research and Application (COSERA). COSERA is a high-level forum for identifying, through collective interaction of its members, the priority needs in research and application to promote the widespread use of solar energy, as well as indicating possible donor sources for financing such activities. It would thus act as a catalyst to achieve optimum results from the multitude of efforts in many organizations in different countries. The first meeting of COSERA was held at Vienna in 1986. The second meeting was held at Beijing, China, from 11-15 December 1989.

42. UNIDO has paid considerable attention to the development of new and renewable sources of energy (NRSE). This is reflected in completed and ongoing projects promoting the use of NRSE and the local low-cost manufacture of relevant components. The share of NRSE in the total technical assistance delivery of UNIDO increased from 0.5 per cent in 1980 to 3 per cent in 1987, thus amounting to almost one-third of overall energy activity. Areas of concentration are biomass, solar, wind and mini-hydropower. An example is an ongoing project for the manufacture of wind turbines for electricity generation in Egypt. This project was created on the basis of a national strategy to supply by the year 2000 some

5 per cent of the national energy requirements through the application of NRSE, including wind power. The project aims at establishing manufacturing and testing facilities for the local production of wind turbines with a capacity of 90 kw for the generation of electricity through the transfer of technology, to be adapted to local conditions, as well as for the provision of expertise, training and supply of related equipment. It is expected that, at the end of the project implementation, a prototype of the wind turbine will be produced and successfully tested for application on wind farms. In addition, a batch of 100 wind turbines will be manufactured and sited in groups for grid connection, and a full operational testing facility for electricity-generating wind turbines will be established to enable the New and Renewable Energy Authority of Egypt to carry out a wide range of tests relating to wind energy technologies in the country.

43. In view of the extensive reserves of exploitable low-grade coal in many developing countries, UNIDO has provided technical assistance to improve the efficiency, environmental acceptability and cost effectiveness of using low-grade coal. Projects have been undertaken in Bulgaria, China, India, Poland, Yugoslavia and several other countries in Asia and Latin America. Through technical cooperation UNIDO has been transferring the most up-to-date technology in gasification, fluid bed combustion and direct liquefaction, aimed at minimizing the environmental impacts of using low-grade coals. Assistance in monitoring pollution arising from coal combustion and in recommending abatement options plays an increasingly important role in UNIDO's coal projects. Utilization of low-grade coal requires the application of special technology so that international standards for atmospheric emissions can be met. Investment decisions are based on technical and economic feasibility and assurances of environmental acceptability. To facilitate such decisions UNIDO has upgraded the R and D capacity of national institutions working on low-grade coal utilization.

44. In the field of petroleum refining, six workshops were organized in the area of maintenance, plant inspection and energy management in petroleum refineries and petrochemical plants. Special emphasis was put on energy savings and conservation methods: some 120 participants from developing countries have attended workshops since 1981 and others are planned. Technical assistance has been provided since 1985 to the Regional Petroleum Training Centre in Angola for all countries of the Southern African Development Co-ordination Conference, and some 600 trainees have graduated in different disciplines of the petroleum sector.

45. Requests have been received for assistance in energy conservation in the petrochemical industry in Pencevo, Yugoslavia, and cooperation was given to Ghana for a study in petroleum products pricing in that country. In association with other agencies, UNIDO is also involved in an energy conservation programme for cement plants in Pakistan.

46. Technical assistance has been recently provided to Viet Nam for an energy plan for the industrial sector. This will provide the Government of Viet Nam with the basis of a framework for formulating an energy master plan. The study reviews and assesses the current available statistical data and information in the energy sector and identifies the requirements for the Government to develop a comprehensive development plan.

47. Computer software has been developed to assist industries to identify the benefits of energy conservation. Other projects are aimed at strengthening capability to promote the rational and efficient use of energy in local industrial sectors. A booklet, "Successful cases of energy conservation", is planned as a project output and will be delivered to developing countries as a means of disseminating practical know-how and experiences in energy conservation gained by industrialized countries.

48. In view of the need to train plant managers in energy auditing, an energy diagnostics kit has been developed and was demonstrated in a few developing countries. The kit, costing about $20,000, shows how the thermal units in building material processing plants deviate from normal/effective operational conditions and it has been instrumental in introducing comprehensive energy management systems to the industry.

49. The UNIDO programme in non-metallic minerals is continuously introducing new raw materials which may lower processing temperatures without adverse effect on the projections and quality of the products.

50. The Government of Egypt embarked on a plan to better utilize the country's oil reserves following the rise in the price of crude oil by approximately 200 per cent in 1973-1974 and a similar rise in 1978-1980. Consequently, UNIDO assisted Egypt from 1986 to 1987 with the focus on metallurgical and glass industries. In particular assistance was provided in improving the energy performance of a 60-ton glass melting furnace in the Mostorod Glass Factory, carrying out an energy audit/balance study and introducing measures to reduce energy utilization. With project funds totalling $650,000, UNIDO provided the expertise to identify main problem areas to improve energy-saving technology. A metallic recuperator was installed, a few adjustments were made in batch composition, and an operational regime of the furnace was introduced, thus generating 30 per cent of energy saving in oil consumption.

51. In the area of industrial and technological information, UNIDO has assisted in the establishment of an energy conservation information network in eastern Europe and its extension to the Philippines. A multi-purpose database application was created and is in use in 16 centres in 10 countries.

52. The INECA Journal (Industrial Energy Conservation Abstracts), launched in 1990, provides technical information on energy conservation collected through network activities from UNIDO and external sources. The 1991 issues will combine abstracts on energy and environment in relation to industry.

III. OBJECTIVES OF THE PROGRAMME

53. The UNIDO energy programme proposed in the present document is based on the following key issues:

(a) Identifying special areas of opportunity:

(i) Special energy needs of the developing countries;

(ii) The use of appropriate advanced technology to fill market gaps;

(iii) Focus on near-commercial technologies;

(iv) Utilizing the expertise and experience of UNIDO;

(b) Recognizing limitations imposed by energy markets:

(i) Oil prices likely to be constant;

(ii) Conventional energy resources abundant;

(iii) Feasible energy options based on low world energy prices and indigenous resources;

(c) Focusing on replication of successful programmes and locally available resources:

(i) New and renewable sources of energy (subject to economic tests);

(ii) Coal resources;

(iii) Maximum prospects for replicability;

(d) Fostering environmental protection by promoting energy conservation:

(i) Reviewing successful projects to date;

(ii) Surveying "the conservation gap" (conservation opportunities constrained by capital scarcity);

(iii) Working with donors to create investment packages;

(iv) Encouraging realistic pricing policies as prerequisite;

(e) Assuming active role in promoting appropriate technologies:

(i) Developing roster of successful model projects and list of prospective beneficiaries;

(ii) Promoting successful models in future programming exercises.

54. As described in the previous chapter, energy has long been an important aspect of UNIDO activities. Consequently an energy programme will not introduce any major new elements to what is already an important component of UNIDO work. Rather it would constitute a redirection of effort for the purpose of increasing efficiency and maximizing impact. The proposed programme is designed to strengthen relevant ongoing activities by focusing UNIDO efforts on key "areas of opportunity" and to ensure that future energy-related activities of UNIDO (a) embody the increasing concerns world wide for environmental protection and (b) reflect the basic links between energy supply, economic growth, and the environment.

55. Specifically, the proposed programme is designed to fill some recognizable gaps. In the first place, several specialized agencies within the United Nations system are concerned with various aspects of energy, but so far, there is no coherent programme spanning those agencies. While the programme proposes integrated priorities for UNIDO's future activities relating to energy, it is also designed to provide the basis for coordination between UNIDO's energy-related activities and its environment programme (see para. 1) and for cooperation with other agencies on both energy and environmental issues. In the second place, the programme addresses the "areas of opportunity", making UNIDO energy-related activities more selective and more focused, linking need with capability, and identifying those energy areas where UNIDO expertise best matches the special energy requirements of developing countries. A principal guideline will be the emphasis on locally available energy resources. UNIDO will concentrate on promoting the economically feasible energy options which make best use of each country's own resources. Priority will be given to the energy options which minimize capital costs and which maximize foreign exchange savings. This means emphasizing and adapting technologies that rely on local natural resources including new and renewable sources of energy, such as wind power as well as depletable energy resources, such as low-quality coal. It also emphasizes those options using local manufacturing capability. Priority will also be given to energy projects which are commercially feasible, "replicable", economical and easily publicized and disseminated. The multiplier effect is critical: projects must be chosen to serve as examples and models.

56. A further "area of opportunity" is energy conservation. Energy conservation projects can be doubly beneficial by reducing both real energy costs and adverse environmental impacts. However, the stumbling block in developing countries is that although energy conservation - like energy production - requires capital, financing for such projects is rarely available. Energy conservation hitherto has fallen between the cracks in the structure of development assistance. No matter how feasible they may be, such projects are too small to attract financing, particularly from financing institutions such as the World Bank, the International Finance Corporation, or the regional banks. UNIDO proposes to overcome this drawback by identifying and packaging sets of such projects, by developing financing mechanisms, and by undertaking to link appropriate technology with flexible financing.

57. Two main considerations are also taken into account in the proposed programme. First, energy prices are likely to rise little, if at all, during the planning period. The programme proposes careful feasibility tests to establish priorities for the use of renewable resources against the low-cost but depletable fossil-based resources. Second, environmental protection measures compete with energy production for scarce capital - both are expensive, especially for developing countries, so that projects require a careful balancing of local options and real costs to guarantee energy supply while minimizing the environmental impact.

58. The overall objective of the proposed UNIDO energy programme is thus to provide a new focus

for UNIDO activities relating to energy and industry and to ensure that energy projects take into account the need for ecologically sustainable industrial development. Within that broad objective, a set of guidelines and subsidiary objectives have been identified which will be incorporated in the planning and execution of future energy projects:

(a) Focus on the technologies or options where existing markets are least able to develop the solutions. There is a clear "niche" for UNIDO in catalyzing the development or adaptation of technological options which are better suited to the needs of the developing countries than those generally available from the traditional suppliers of equipment;

(b) Emphasis on those projects with the most promising near-term prospects for commercialization. Basic energy research is expensive and in view of the limited resources at UNIDO's disposal, the energy progamme would focus on those projects which are most likely to add quickly to the energy supply or result in energy conservation but require little research and development;

(c) Promotion of energy technologies based on UNIDO industrial expertise, maximizing the transfer of knowledge on energy technologies to developing countries through improved mechanisms for technology transfer and information dissemination;

(d) Concentration on methods for more systematically demonstrating and promulgating energy technologies in order to maximize the "multiplier" or "demonstration" effects. Again, given the limited resources of UNIDO but in view of its established expertise, maximum benefits can be obtained from energy projects for which the experience can be disseminated to other similar projects i.e. where the potential carry-over impacts are the greatest, in contrast to "one-off" projects;

(e) Integration of energy pricing issues into energy projects. Artificially low energy prices are persistent disincentives for energy efficiency and inter-fuel substitution; the effectiveness of conservation projects can be undercut or severely limited when pricing policies do not support it. Realistic energy cost projections will be factored into feasibility studies;

(f) Creation of a balance between energy and environmental considerations. Both the environmental impacts and the costs of environmental protection will be articulated in energy-related projects;

(g) Co-ordination of energy projects within UNIDO (including both production and conservation). Since energy activities are spread across different Divisions and Departments, a mechanism will be provided for systematic coordination;

(h) Co-operation in energy activities with other United Nations organizations, such as UNDP, the United Nations Environment Programme (UNEP), the World Bank, and the International Atomic Energy Agency (IAEA), concerning the energy sector. UNIDO will endeavour to strengthen operational links.

IV. THE PROPOSED PROGRAMME: OUTPUT AND ACTIVITIES

59. The proposed UNIDO energy programme is designed to meet the special needs of the developing countries with respect to the supply and use of energy. It is based upon adapting UNIDO's current capabilities to those energy issues which are of special importance to the developing countries. In particular it addresses the trade-offs between environmental concerns and the compelling need for energy to fuel economic growth.

60. The energy programme is based on three broad principles:

(a) Compatibility: ensure that projects are proposed and reviewed with respect to both their energy and environmental aspects;

(b) Identification of "niches": those special areas, where UNIDO enjoys the greatest technology advantage;

(c) Maximizing demonstration effect: focus on those projects that can serve as models for broader applications elsewhere.

61. The programme consists of four identifiable subprogrammes which will be executed in parallel e.g., all four subprogrammes will be dealt with at the same priority level.

Subprogramme I: Enhancing UNIDO's capacity to provide support to energy-related aspects of industrial development

I.1. Problem to be addressed

62. The growing complexities and the impact of industry on the environment as it relates to energy use, and the need for increasingly diversified technical assistance to alleviate that impact make it essential that energy considerations be incorporated in the development, appraisal, implementation and evaluation of UNIDO projects and that adequate expertise exist in the Organization to provide the requisite assistance to the developing countries.

I.2. Objective

63. To increase, through training, education and recruitment, the capacity of UNIDO to provide effective energy technology-related assistance and to develop and apply appropriate project development and implementation tools relating to advanced energy technologies.

I.3. Subprogramme focus

64. Strengthening UNIDO's capabilities in the fields of technological know-how for industrial energy conservation and efficiency, technical cooperation project design and definition of policy and regulations regarding energy matters.

I.4. Output

65. (a) Consolidated and supplemented in-house guidelines and information on project design and appraisal, energy system evaluations, and project implementation.

(b) Improved coordination among the different Units at UNIDO concerned with energy

issues by creating ad hoc working groups, developing energy databases and training packages, but without adding any new reporting structure. Models for such information exchanges exist and will be exploited. Expert group meetings will be organized to assist UNIDO develop programme priorities.

(c) Development of UNIDO programme priorities.

(d) An inventory of promotable experience coupled with a matching inventory of prospective beneficiaries. In the energy area UNIDO will actively propose to Member States those projects considered potentially useful in energy conservation or production, based upon prior successful models or demonstrations. Studies will be undertaken to establish the scope of such opportunities and to investigate possible financing instruments.

(e) Modified Computer Model for Feasibility Analysis and Reporting (COMFAR) incorporating a module on energy systems analysis as part of pre-investment studies of industrial projects and assessments of operating costs.

(f) Trained UNIDO staff involved with the project cycle familiar with the above outputs.

(g) Established collaboration with related international or multinational agencies in complementary areas to avoid duplication of effort. International organizations will include those with energy- and environment-related mandates, such as IAEA, and UNDP, as well as those indirectly concerned with energy, such as the International Bank for Reconstruction and Development (IBRD).

I.5. Activities

66. (a) Hold expert group meeting for definition of programme priorities.

(b) Develop and issue guidelines on evaluation and incorporation of high efficiency energy systems in the industrial cooperation projects, drawing on information from and experience of national and international organizations and agencies and Government energy departments, as necessary.

(c) Develop methodologies for energy system evaluations as part of feasibility and pre-investment studies, as well as in national and sectoral planning.

(d) Establish procedures and guidelines for relevant UNIDO staff to input directly to database.

(e) Develop tools to assess the economic impact of high efficiency energy systems on investment and operating costs at the enterprise level.

(f) Review all projects for energy content and develop database to record/monitor those projects.

(g) Conduct briefings on advanced energy systems for all UNIDO staff concerned with technical cooperation and promotion activities.

(h) Conduct seminars and training programmes, including on-the-job training for UNIDO staff in project design, appraisal, implementation, management and evaluation using advanced technology considerations.

(i) Establish ad hoc working groups in-house to explore areas of mutual interest and capabilities in the energy area and to ensure that the energy aspects of projects are addressed and understood.

Subprogramme II: Assistance to developing countries in planning industry-related energy policies

II.1. Problem to be addressed

67. Developing countries could make a decisive contribution to world energy conservation as well as protection of the environment by using high efficiency advanced energy technologies within their own borders. Yet, many developing countries lack sufficient experience to deal with energy issues, as well as the necessary institutional infrastructure to appraise the impact on industry and living standards. They also lack the experience to develop policies, norms, standards, regulations and legislation that give adequate consideration to both environmental and economic/financial issues with respect to industry, and to focus industry towards using more efficient and environmentally benign technologies.

II.2. Objective

68. To enhance capabilities of developing countries to conduct industry-related energy technology assessments and to assist them in formulating national energy policies and strategies in particular with regard to industry-related norms, standards, regulations and legislation, relating to energy production and use.

II.3. Subprogramme focus

69. Focus on the energy-intensive industries in developing countries to include industrial subsectors and power generation plants using indigenous fuels (coal, oil, natural gas) (Subprogrammes 522, 523, 524, Industrial Operations).

70. Focus on application of cost-effective energy technologies using local natural resources and minimizing environmental impact while recognizing the continued use of oil and natural gas where economically feasible.

II.4. Output

71. (a) Completed programmes to train developing country cadres in energy system planning for industry (in particular, system assessments) and in formulation of industry-related national policies and strategies, energy standards, regulations and legislation.

(b) Selection of the optimum mix of energy resources for the various industrial sectors from the available options particularly as regards the location of new industries and as input to energy resource planning.

(c) Advisory projects to assess the energy efficiency of specific industrial plants in the requesting developing countries and provide options to Governments in the establishment of industry-related norms, standards, regulations and legislation. This will include assisting countries to establish true energy costs based on world energy prices.

(d) Advisory projects in developing countries on selection of technologies including evaluation of tenders and improved capabilities in existing industrial R and D centres.

(e) Methods, manuals and information on energy systems evaluation in place.

II.5. Activities

72. (a) Provide advice and training to the Governments of the developing countries in formulating policy for energy use and conservation.

(b) Conduct studies on energy use/production and alternative technologies available to alleviate inefficiencies in industry.

(c) Developing databases and guidelines for introducing energy efficient systems in industrial enterprises in cooperation with other agencies.

(d) Disseminating manuals and information on methodology for energy system evaluations, in cooperation with other United Nations agencies.

Subprogramme III: Sustainable energy development and use

III.1. Problem to be addressed

73. Developing countries are currently not exploiting and utilizing locally available energy resources in an environmentally-sound manner or with any emphasis on energy conservation. They have failed to take full advantage of local fuels (particularly biomass and low grade coals) and to use experience gained elsewhere with utilization of these fuels.

III.2. Objective

74. UNIDO will assist the development of energy alternatives based on locally available resources in developing countries. This will include biomass energy, particularly agricultural and forest industry wastes, and utilization of low-grade coal which in many developing countries constitute a valuable source of local fuel. Through experience gained by implementing large-scale projects in Bulgaria, China, India and Poland combined with the well-established R and D capabilities in those countries, UNIDO will promote and extend this activity to other developing countries with such resources so that they will make good use of these fuels.

III.3. Subprogramme focus

75. Environmental and conservation issues, with respect to energy, shall be addressed in parallel along with technologies applicable to local utilization and development of local fuels.

III.4. Output

76. (a) Database to track energy aspects of current and new UNIDO projects.

(b) Identification and promotion of projects which promise significant energy conservation potential. Emphasis on environmental aspects as well as energy to maximize joint benefits.

(c) Demonstrated energy auditing through projects to include identification of the required level of expertise in energy management.

(d) Conservation in developing countries (Programme 420, Industrial Investment).

III.5. Activities

77. (a) Identify those industrial subsectors where maximum impact can be expected.

(b) Consolidate and group conservation projects to increase probability of financial support.

(c) Identify and implement projects which include the collateral results of higher efficiency and a reduction in emissions and pollutants (Programme 520, Industrial Operations Technology).

(d) Conduct briefings for developing countries on advanced technologies.

Subprogramme IV: Industry for energy

IV.1. Problem to be addressed

78. Developing countries normally lack the capital to import advanced technologies on a large-scale basis. They also lack the resources to develop a manufacturing capability that enables the manufacture of capital equipment for energy systems locally or the use of local new and renewable energy systems (NRSE) effectively.

IV.2. Objective

79. To increase the application of new and renewable energy technologies within developing countries as well as establish the manufacturing infrastructure to build and repair these technologies within the developing countries.

IV.3. Subprogramme focus

80. Industries capable of using advanced energy technologies with new and renewable resources within developing countries; industries to manufacture and maintain these technologies within the country.

IV.4. Output

81. (a) Established centres of excellence at the international and regional level for NRSE, building on the experience already gained in the fields of small hydropower and solar energy (Subprogramme 454, New Technologies).

(b) Research and application projects in advanced technologies relevant to the energy sector.

(c) Capability within developing countries for the local manufacture and maintenance of energy equipment.

(d) Established local capabilities in repair and maintenance for energy equipment in developing countries (Subprogramme 331, Programme and Project Development, Africa).

IV.5. Activities

82. (a) Promoting centres of excellence at the international and regional level.

(b) Identification of research and application projects in advanced technologies relevant to NRSE.

(c) Assistance and advice on setting up a capability for the local manufacture of energy equipment.

(d) Assistance in the establishment of local capabilities in repair and maintenance for energy equipment in developing countries.

V. IMPLEMENTATION ARRANGEMENTS AND RESOURCE REQUIREMENTS

Implementation arrangements

83. The basic principle is one of inter-departmental and inter-agency cooperation in rendering effective assistance to the developing countries on specific energy issues and problems. To that end, it would be necessary to establish an impartial coordination mechanism within the Organization that, in addition to standard in-house and inter-agency coordination, should be primarily engaged in programme promotion, project development, resource mobilization, and include cooperation with development finance institutions with regard to energy matters. Whereas the coordination mechanism would contribute to the identification of new project opportunities arising from the integration of energy technology criteria into the production system, the implementation of projects would be the responsibility of the technical units in the substantive Departments. In carrying out its tasks, the coordination mechanism would: (a) support Area Programmes staff and in-house technical cooperation staff active in the subsectors identified in the proposed programme; (b) draw on consultant resources in industry-wide areas identified in the proposed programme so as to supplement in-house capabilities and provide the requisite expertise to the developing countries in programme and project development; (c) ensure the appropriate involvement of relevant non-governmental organizations and research institutions; (d) ensure the effective coordination of the efforts of UNIDO with those of other United Nations agencies, especially UNDP, in the interests of reducing duplication and securing the fullest contribution of UNIDO to forthcoming conferences on energy use and conservation; and (e) report regularly to the Industrial Development Board and the General Conference on progress made towards the implementation of the UNIDO energy programme.

Resource requirements

84. The proposed programme could be funded in several ways:

(a) Redeployment of resources in the regular and/or operational budgets for the biennium 1992-1993 as they become available from savings - if any - and programme modifications, as they occur;

(b) Establishment of an energy trust fund financed through voluntary contributions by Member States, institutions and enterprises; and

(c) Special-purpose contributions to the Industrial Development Fund (IDF), including the financing of experts.

85. It follows that the redeployment of resources under (a) is contingent upon funds being available under (b) and (c). At the time of writing, specific contributions have not been identified. However, several Member States have expressed interest in supporting efforts to address energy issues in developing countries. It is realized that the proper application of energy resources in developing countries is critical to proper energy growth world wide, with environmental concerns in mind. It is hoped that approval of the proposed programme will result in Member States providing contributions in this area.

86. An indication of funds required to launch the proposed programme is given in the table below. The large majority of funds for subprogrammes II through IV would come from project proposal funding. Experts to assist in the development of background data, and the preparation of programme proposals, the formulation of needs in the area of policy and resource development in developing countries would be financed from voluntary contributions.

VI. ACTION REQUIRED OF THE BOARD

87. The Industrial Development Board may wish:

(a) To approve the proposed energy programme of UNIDO and its activities as outlined in paragraphs 53 to 82 above;

(b) To take note of the proposed funding of the programme through:

(i) Redeployment of resources from the regular and/or operational budgets 1992-1993 as mentioned in paragraph 84 (a) above;

(ii) The establishment of a trust fund for energy in compliance with Article 16 of the Constitution of UNIDO and regulations 6.1, 6.3 and 6.4 of the financial regulations of UNIDO;

(iii) Special-purpose contributions to the Industrial Development Fund;

(c) To call upon Member States to make the maximum possible voluntary contributions to a trust fund for energy.

Funds required to launch the proposed energy programme
in the biennium 1992-1993

(in US dollars)

Redeployment from RB/0B			Voluntary contributions			
Coordination mechanism	Staff costs	Subprogrammes	Consultants	Meetings	Travel	Total
Coordinator	----	Coordination	50,000	10,000	20,000	80,000
		I	30,000		25,000	55,000
		II	53,000		32,000	85,000
GS Support Staff	40,000	III	34,000		56,000	90,000
		IV*				
	40,000		167,000	10,000	133,000	310,000

* Accomplished through project funds.